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volts, being capable, however, of regulation through a wide range. The tops of the alternating current waves of high potential obtained from this secondary transformer were used to charge a number of glass plate condensers in parallel. The rotating frame synchronously driven with the motor made the connection to the condensers periodically and in synchronism with the alternating current. The connection by the rotating frame is alternately in parallel and in series, the condenser plates being charged to 15,000 volts with ten in parallel, giving 150,000 volts when connected in series. The machine therefore furnishes from low pressure direct current, high potential discharges of definite polarity at the discharged terminals. The new rotary electrical apparatus consisted of an iron sphere heavily electroplated with copper and mounted so that it may revolve on any axis or in any plane. Surrounding this sphere were three coils in planes at right angles to each other. By suitably energizing these coils with polyphase current the sphere was made to revolve on any axis or in any direction, thus illustrating a three dimension polyphase system. This apparatus shows in a very satisfactory manner the principles of the gyroscope and Bohnenberger sphere.

Professor Thomson also exhibited an aluminum disc mounted on a shaft free to rotate, and having applied to it in special ways alternating current magnetic fields, the rotations of the disc involving interesting paradoxes which the visitors were asked to explain.

Mr. E. V. Baillard showed the Parker-Baillard bridge for measuring low electrical resistances for general work and standardization and an ingenious faradmeter for the direct measurement of capacity. Some interesting spark experiments, showing oscillating discharges occurring rapidly during the same half wave, and proving that a short circuit in a high potential current containing

inductances and capacity ruptures itself instantly, were shown by Mr. W. S. Andrews who also exhibited a luminous aluminum cell giving beautiful effects.

Among the many other exhibits were various forms of storage batteries by Mr. Elmer A. Sperry, Mr. Herbert Lloyd, Mr. A. S. Hubbard and Messrs. Frank Perret, J. A. Barrett, and W. H. Meadowcroft. Mr. H. R. Palmer showed a fac-simile picture telegraph in operation, Mr. Otto T. Louis an electric furnace and an ohmmeter. A specimen of the standard United States Army field telephone and telegraph kit used in the Cuban and Philippine campaigns, and wireless telegraphy as improved by the Government, were in charge of Col. Samuel Reber, U. S. A.

W. C. ANDREWS.

SCIENTIFIC BOOKS.

Erinnerungen aus meinem Leben. Von A. KÖLLIKER. Leipzig. 1899. 8vo. Pp. x + 399.

This work of the veteran celebrated histologist is much more than an autobiography, since it includes a number of original contributions to science, with which the anatomist and embryologist must necessarily acquaint themselves.

The first part is strictly biographical, giving a general account of the author's life, which passed without exciting elements along academic paths. Kölliker was born at Zürich, in Switzerland, on July 6, 1817, the elder of two children. He dwells somewhat upon the recollections of his boyhood, recalling with pleasure a few boyish escapades. He early displayed great fondness for nature; he loved the mountains and made collections of plants and minerals, and therefore was led naturally to the study of medicine. But practice had no allurements for him, especially since he soon fell under the spell of the microscope, as a revealing instrument, in the employment of which he has spent his long life. In the summer of 1839 he went to Bonn, hearing there medical lectures in Latin, and the autumn of the same year he passed to Berlin and came under the

direct influence of Germany's greatest morphologist, Johannes Müller, and of Jacob Henle. The latter brought him to the study of the microscopic anatomy of the human body, and so started him upon the career of investigations, which, sixty-two years later, he is still pursuing. It is an interesting coincidence that Kölliker's career began in 1839, the very year in which Schwann established the cell doctrine for animals, so that he has lived through the whole period of the application of that doctrine to the problems of morphology, physiology and pathology, and has, during this epoch, achieved the remarkable distinction of having contributed more than any other single investigator to our knowledge of the cellular structure of animals. It is difficult to realize how many of the fundamental facts of microscopic anatomy, even of those which have been taught in elementary text-books for forty or fifty years, we owe to the discoveries of Kölliker.

In 1841, he became assistant to Henle, who was then at Zürich. In 1844 he was promoted to be professor extraordinarius of physiology. The conditions at Zürich were unsatisfactory, so that in 1847 he accepted a call to Würzburg, where he has since remained, for over half a century. In 1848 he married Maria Schwarz, of Mellingen, in Switzerland.

The volume gives a list of the celebrations in which the author took part, and a list also of all the medals, prizes and other honors which have been bestowed upon him. There are also accounts of his journeys, several of which took him to the sea-shore for purposes of research. The accounts are chiefly in the form of letters, written at the time, and they include a great number of interesting impressions of famous scientific men which offer valuable material for the history of science during the century.

There are three portraits of the author—that which forms the frontispiece is an admirable likeness of the handsome and intellectual face. Another full-page illustration is a photograph of the carved box which was made for the congratulatory address presented to Kölliker on his eightieth birthday.

The second part of the work enumerates his activities as a university teacher and adminis-

trator, including the various courses of lectures he has delivered. Next follows the annotated catalogue of his publications, classified with considerable care. The annotations are often explanatory of the origin and purposes of the separate publications and of the standpoint of the author at the time. Other notes define the share of an essay in developing and fixing scientific conclusions. Finally one encounters, apropos of several articles in the catalogue, additional new observations recorded, which serve to correct and amplify the original record. Some of these observations are illustrated by new figures also. In brief, there is scientific matter included, which is here published for the first time.

Kölliker's 'Erinnerungen' is different in many respects from the usual autobiography, but is certainly a remarkable contribution to the record of the general condition and progress of science during the second half of last century.

CHARLES S. MINOT.

The Bird Book. By FANNIE HARDY ECKSTORM. Boston: D. C. Heath & Co. 1901. 12mo. Pp. xii + 276; 24 pls., map, and 31 figs. in text.

The Woodpeckers. By FANNIE HARDY ECKSTORM. With Illustrations. Boston and New York: Houghton, Mifflin & Co. 1901. 12mo., pp. viii + 132; 5 col. pls., 21 figs. in text.

The time was, not many decades ago, when the young student of ornithology was, of necessity, self-taught, learning almost wholly by his own unaided observation in the field. Nowadays the demands of a multitude of would-be learners for short and easy paths to knowledge have led to the making of many books, that serve, at least, to show how hard it is for books alone to give the beginner the training he needs. How to observe carefully and thoroughly, and how to interpret what one sees, are not readily learned, except by the hard school of experience.

In these two volumes Mrs. Eckstorm has to a remarkable degree succeeded, where some of her predecessors have failed, and surely has gone far toward accomplishing the seemingly impossible. Even abstruse technicalities and fundamental biological principles are stated so clearly and simply that a child easily may com-